

# **INDOOR AIR QUALITY ASSESSMENT**

**Department of Early Education & Care  
326 Clark Street  
Worcester, Massachusetts**



Prepared by:  
Massachusetts Department of Public Health  
Bureau of Environmental Health  
Indoor Air Quality Program  
January 2019

## Background

<b>Building:</b>	Department of Early Education & Care (EEC)
<b>Address:</b>	326 Clark Street Worcester, MA
<b>DCAMM Project Manager:</b>	Paul Burke, Senior Project Manager, Division of Capital Asset Management and Maintenance (DCAMM)
<b>Reason for Request:</b>	Post-occupancy assessment
<b>Date of Assessment:</b>	December 27, 2018
<b>Massachusetts Department of Public Health/Bureau of Environmental Health (MDPH/BEH) Staff Conducting Assessment:</b>	Jason Dustin, Environmental Analyst/Inspector, Indoor Air Quality (IAQ) Program
<b>Building Description:</b>	The EEC space is located on the first floor of a two-story building and has been completely renovated. The space is composed of private offices, open work areas, and conference rooms. Most areas have carpet tiles and dropped ceilings.
<b>Windows:</b>	Windows are not openable.

## Methods

Please refer to the IAQ Manual for methods, sampling procedures, and interpretation of results (MDPH, 2015).

## Results

The following is a summary of indoor air testing results (Table 1).

- ***Carbon dioxide levels*** were below the MDPH guideline of 800 parts per million (ppm) in all areas assessed.
- ***Temperature*** was within the MDPH recommended range of 70°F to 78°F in most areas.
- ***Relative humidity*** was below the MDPH recommended range of 40% to 60% in all areas as is typical during the heating season in the Northeast.
- ***Carbon monoxide*** levels were non-detectable (ND) in all indoor areas assessed.

- ***Fine particulate matter (PM<sub>2.5</sub>)*** concentrations measured were below the National Ambient Air Quality Standard (NAAQS) level of 35 micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ) in all occupied areas.

## **Discussion**

### **Ventilation**

A heating, ventilating, and air conditioning (HVAC) system has several functions. First it provides heating and, if equipped, cooling. Second, it is a source of fresh air. Finally, an HVAC system will dilute and remove normally occurring indoor environmental pollutants by not only introducing fresh air, but by filtering the airstream and ejecting stale air to the outdoors via exhaust ventilation. Even if an HVAC system is operating as designed, point sources of respiratory irritation may exist and cause symptoms in sensitive individuals.

The HVAC system in this space consists of large rooftop air handling units (AHUs) that draw in fresh air from intakes on the roof. Supply air is ducted to ceiling-mounted supply diffusers throughout the space. Return air is brought back to the AHUs through return vents.

To maximize air exchange, the MDPH recommends that both supply and exhaust ventilation operate continuously during periods of occupancy. In order to have proper ventilation with a mechanical supply and exhaust system, the systems must be balanced to provide an adequate amount of fresh air to the interior of a room while removing stale air from the room. It is recommended that HVAC systems be re-balanced every five years to ensure adequate air systems function (SMACNA, 1994).

### **Microbial/Moisture Concerns**

Two water-damaged ceiling tiles were noted in the men's bathroom during this assessment (Picture 1). Porous building materials (e.g., carpeting, gypsum wallboard, ceiling tiles) that are not dried within 24 to 48 hours of being wet may support mold growth and should be discarded. Repairs should be made to stop any active leaks.

There were a large number of plants in occupied areas (Table 1). Some of these plants were on porous items, lacking waterproof drip pans, or growing against porous building materials (Pictures 2 and 3). Plants can be a source of odors, pollen and mold. Plants should be kept in good condition, not overwatered, and not placed on porous materials.

## **Other Conditions**

The second floor (above the EEC space) was being actively renovated at the time of this assessment. Some gaps between the EEC-occupied space and the area under construction were observed (Pictures 4 and 5). These pathways may allow construction odors and particulates into the space if they are not properly sealed.

BEH staff noted one missing ceiling tile in the public reception area (Picture 6). All ceiling tiles should be replaced and seated properly in the ceiling grid to avoid the migration of odors and particulates from unconditioned spaces.

Hand sanitizers, scented cleaning products, and air fresheners were noted in some areas of the office space. These products can cause irritation of the eyes, nose, and respiratory system of some people.

Most flooring is covered with carpet tile. The Institute of Inspection, Cleaning and Restoration Certification (IICRC), recommends that carpeting be cleaned annually (or semi-annually in soiled high traffic areas) (IICRC, 2012).

Some occupants in the open cubicle area reported complaints regarding solar glare from south-facing windows. Solar glare can affect occupant comfort and IAQ perception. Blinds or window tinting should be considered to reduce these complaints.

## **Conclusions/Recommendations**

Based on the observations made during the visit, the following is recommended:

1. Operate the HVAC system to provide for continuous fresh air ventilation during occupied hours. Inspect all thermostats to ensure that they are set for “fan on” instead of the “auto” setting.
2. Discard water-damaged ceiling tiles in men’s bathroom and replace. Make repairs as necessary if there is an active water leak in this area.
3. Replace any missing ceiling tiles (e.g., reception area) and ensure they are all seated properly in the ceiling tile grid.
4. Reduce or eliminate the use of scented cleaners, hand sanitizers, and personal air fresheners.
5. Property management/contractors should consult the MDPH guideline: “[Construction and renovation generated pollutants in occupied buildings](#)”. Implement the recommended isolation/depressurization strategies during active renovation projects. Any pathways that

lead from the construction area to the EEC space should be sealed. This would include pathways that lead to the ceiling plenum.

6. Regularly vacuum carpeting with a HEPA-filtered vacuum cleaner. Clean carpeting at least once per year according to IICRC recommendations (IICRC 2012).
7. Properly maintain plants, including drip pans, to prevent water damage to porous materials. Plants should also be located away from air diffusers to prevent the aerosolization of dirt, pollen, and mold. Consult the MDPH guideline “[Indoor Plants and Indoor Air Quality](#)” to avoid problems associated with improper plant maintenance.
8. Continue to change filters for HVAC equipment 2-4 times a year. Continue to use pleated filters of MERV 8 (or higher), which are adequate in filtering out pollen and mold spores (ASHRAE, 2012), if these can be used with current equipment.
9. Consider adopting a balancing schedule of every 5 years for all mechanical ventilation systems, as recommended by ventilation industrial standards (SMACNA, 1994).
10. Consider installing window tinting or blinds on south-facing windows to reduce comfort complaints related to solar glare.
11. Refer to resource manuals and other related IAQ documents for further building-wide evaluations and advice on maintaining public buildings. Copies of these materials are located on the MDPH’s website: <http://mass.gov/dph/iaq>.

## References

ASHRAE. 2012. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) Standard 52.2-2012 -- Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size (ANSI Approved).

IICRC. 2012. Institute of Inspection Cleaning and Restoration Certification. Institute of Inspection, Cleaning and Restoration Certification. Carpet Cleaning: FAQ. Retrieved from <https://www.iicrc.org/general/custom.asp?page=SANSIIICRCS100>.

MDPH. 2015. Massachusetts Department of Public Health. "Indoor Air Quality Manual: Chapters I-III". Available at: <http://www.mass.gov/eohhs/gov/departments/dph/programs/environmental-health/exposure-topics/iaq/iaq-manual/>.

SMACNA. 1994. HVAC Systems Commissioning Manual. 1<sup>st</sup> ed. Sheet Metal and Air Conditioning Contractors' National Association, Inc., Chantilly, VA.

**Picture 1**



**One of two water-damaged ceiling tiles found in the men's room**

**Picture 2**



**Plant placed on water-damaged/porous material**

**Picture 3**



**Overgrown plant over porous carpeting**

**Picture 4**



**Active renovations in room off of EEC hall and 2<sup>nd</sup> floor above**



**Picture 5**



**Pathways leading to 2<sup>nd</sup> floor active renovations**

**Picture 6**



**Ceiling tile not in place within ceiling grid of reception area**

Location: Department of Early Education & Care

Address: 324 Clark Street Worcester, MA

Indoor Air Results

Date: 12/27/2018

Table 1

Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 (µg/m <sup>3</sup> )	TVOC (ppm)	Occupants in Room	Windows Openable	Ventilation		Remarks
									Supply	Exhaust	
Background	427	ND	38	15	14	ND	-	-	-	-	Clear, light wind
Mail room	647	ND	68	24	8	ND	2	N	Y	Y	Plants, NC
104	611	ND	68	22	8	ND	0	N	Y	Y	Carpet tiles
Hotel space	635	ND	68	21	6	ND	0	N	Y	Y	Plants, 1 on porous paper towels
Open cubes near 206	703	ND	68	20	11	ND	1	N	Y	Y	Plants, CPs
Open cubes near 214	652	ND	70	20	12	ND	1	N	Y	Y	HS, CPs
Open cubes near 223	595	ND	71	18	7	ND	0	N	Y	Y	
112	641	ND	71	17	13	ND	0	N	Y	Y	Plants
111	564	ND	71	17	15	ND	1	N	Y	Y	
Open cubes near 215	654	ND	72	17	15	ND	0	N	Y	Y	Plants
110	577	ND	71	16	12	ND	0	N	Y	Y	HS

ppm = parts per million

µg/m<sup>3</sup> = micrograms per cubic meter

ND = non detect

CP = cleaning products

HS = hand sanitizer

NC = non carpeted

TVOC = total volatile organic compounds

#### Comfort Guidelines

Carbon Dioxide: < 800 = preferable

> 800 ppm = indicative of ventilation problems

Temperature: 70 - 78 °F

Relative Humidity: 40 - 60%

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									Supply	Exhaust	
Ginnetti	572	ND	72	16	11	ND	0	N	Y	Y	½ wall office, plant
120	588	ND	72	16	12	ND	0	N	Y	Y	Plants
Open 211	598	ND	72	16	13	ND	2	N	Y	Y	
119	587	ND	72	17	10	ND	0	N	Y	Y	½ wall office
105	590	ND	72	15	13	ND	1	N	Y	Y	Carpet tile
108	537	ND	72	15	10	ND	0	N	Y	Y	
113	552	ND	73	14	10	ND	1	N	Y	Y	
114	551	ND	72	15	9	ND	1	N	Y	Y	
Large conference	591	ND	73	15	5	ND	1	N	Y	Y	
File room	516	ND	71	15	4	ND	0	N	Y	Y	

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